

Claims

- Sup A¹²
1. A method for controlling data cell transmission in a network, the method being implemented at a network element through which data cells are transferred between source and destination nodes, the method comprising:
- receiving a first control cell on a first virtual channel, the first virtual channel being associated with a source node;
- generating a management event upon receipt of the first control cell;
- processing the management event to determine first resource management data;
- receiving a second control cell on a second virtual channel, the second virtual channel being associated with a destination node;
- modifying the second control cell using the first resource management data; and
- transmitting the modified second control cell over the first virtual channel.
2. The method of claim 1 wherein the first control cell comprises an asynchronous transfer mode forward resource management cell and the second control cell comprises an asynchronous transfer mode backward resource management cell.
3. The method of claim 1 further comprising:
- storing the first resource management data in a database; and
- retrieving the first resource management data from the database using virtual channel data associated with the second control cell.
4. The method of claim 1 wherein generating a management event comprises placing virtual channel identification data in a queue and processing the management event comprises removing the virtual channel identification data from the queue and processing the data using a rate control algorithm to determine the first resource management data.

1 5. The method of claim 1 wherein the first virtual channel and the second virtual channel
2 comprise a segment of an end-to-end virtual channel operatively coupling the source node and the
3 destination node.

1 6. The method of claim 1 further comprising forwarding the first control cell over the second
2 virtual channel prior to determining the first resource management data.

1 7. The method of claim 1 wherein the first resource management data comprises first explicit
2 rate parameter data and modifying the second control cell comprises inserting the first explicit rate
3 parameter data in the second control cell.

1 8. The method of claim 1 wherein the first resource management data comprises congestion
2 indicator data and modifying the second control cell comprises setting a congestion indicator bit in
3 the second control cell header in accordance with the first resource management data congestion
4 indicator data.

1 9. The method of claim 1 further comprising computing updated resource management data
2 using the explicit rate indication for congestion avoidance in ATM networks (ERICA) algorithm.

SUB A13 10. A data transmission apparatus for transmitting data and control cells between a source
2 virtual channel and a destination virtual channel, the source virtual channel operatively coupling
3 the apparatus to a source node, the destination virtual channel operatively coupling the apparatus to
4 a destination node, the transmission apparatus comprising:
5 source port circuitry operative to send and receive control cells on a source virtual channel;
6 destination port circuitry operative to send and receive control cells over a destination
7 virtual channel;

switching circuitry operatively coupling the source port circuitry and the destination port circuitry, the switching circuitry comprising circuitry to exchange data and control cells between the source and the destination virtual channels;

management event circuitry operatively coupled to the source port circuitry to receive control cells from the source virtual channel and to compute resource management data by processing the received control cells; and

return cell circuitry operatively coupled to the source and destination port circuitry and to the management event circuitry, the return cell circuitry comprising circuitry to receive control cells from the destination port circuitry, to modify control cells based on the resource management data computed by the management event circuitry, and to provide the modified control cells to the source port circuitry for transmission over source virtual channels.

11. The apparatus of claim 10 wherein the management event circuitry comprises a processor connected to a memory, the memory comprising stored instructions to configure the processor to compute and store resource management data.

12. The apparatus of claim 11 wherein the instructions to configure the processor comprise instructions to associate resource management data with source virtual channels.

13. The apparatus of claim 10 wherein the management event circuitry and the return event circuitry comprise a shared processor coupled to memory circuitry.

14. The apparatus of claim 10 wherein the source port circuitry and the destination port circuitry comprise shared transmission circuitry coupled to a physical link.

15. The apparatus of claim 10 wherein data cells and control cells are fixed-sized asynchronous transfer mode cells.

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16. An asynchronous data transfer mode cell control method, the method being implemented in a network switching element, the method comprising:

establishing a plurality of source virtual channels and destination virtual channels, each source virtual channel being paired with a destination virtual channel to form a cell transmission path operatively coupling a source node to a destination node through the switching element;

receiving a control cell on a first source virtual channel;

generating a management event upon receipt of the control cell, the management event being associated with the first virtual channels;

processing the management event to generate resource management data; and

storing the resource management data in a database, the resource management data being associated with a first transmission path, the first transmission path comprising the first source virtual channel and a paired first destination virtual channel.

17. The method of claim 16 further comprising:

receiving a second control cell on a second source virtual channel;

generating a second management event upon receipt of the second control cell, the second management event being associated with the second virtual channels; and

processing the second management event to generate second resource management data;

storing the second resource management data in the database, the second resource management data being associated with a second transmission path, the second transmission path comprising the second source virtual channel and a paired second destination virtual channel.

18. The method of claim 17 further comprising:

receiving a third control cell on the first destination virtual circuit;

querying the database to retrieve resource management data associated with the first destination virtual circuit;

modifying the third control cell using the retrieved resource management data; and

transmitting the modified third control cell on the first virtual channel.